

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

[002] The present invention relates generally to the field of electrical discharge weapons and specifically to a method and apparatus for improving their effectiveness.

BACKGROUND ART

[003] U.S. Patent No. 3,803,463 issued to Cover in 1974 for a Weapon for Immobilization And Capture. Subsequent, thereto, numerous other patents have issued for electronic stun pistols, rifles, air guns and spring guns. Like the inventions claimed in the 3,803,463 patent, these weapons connect a high tension and low amperage, shocking, power supply through a remote human target by means of projectiles and trailing wires. The high tension supply, typically, operates at 50 KV. Human targets can be disabled with shocks at much lower voltages. However, at 50 KV tension, currents will arc through an atmospheric bench gap of approximately one and one half inches. Such an arc is often needed to conduct the power supply's disabling current through air gaps in a target's raiment, so the disabling shock can complete a circuit path through the target's actual anatomy. Such weapons are designed to stun and subdue violent, even armed, assailants or suicidal individuals without causing them permanent injury. The weapons are used extensively by law enforcement.

[004] In practice, at 50 KV, the supply currents from electronic stun pistols are generally only capable of jumping air gaps of one inch or less at a target. The reason is that, typically, the power supply's electrically opposed contacts are only spaced a little over an inch apart at the ammunition chambers. In the case of stun pistols with

clip-on ammunition, these weapons typically have opposed shunt contacts which are spaced less than three quarters of an inch apart and limit atmospheric arcs at the target to this distance or less (barring the occurrence of a phenomenon known as arc tracking). Such a weapon with clip-on ammunition is described in Patent 6,360,645 issued to McNulty and Chudy in 2002. If the electronic stun pistols are not long enough to penetrate a violent suspect's garments, including winter clothing, the suspect will not be shocked and stunned, with potentially catastrophic consequences for the suspect, peace officers and/or innocent bystanders.

[005] Finally, the length of the arc available for clothing penetration at the target may be further diminished by the power supply current having to first arc through air gaps created in the stun pistol's ammunition cartridges. Before current reaches the target, with all such ammunition cartridges as manufactured to date, the current must first arc through air gaps in the ammunition cartridges, which gaps are created by the explosion of the pyrotechnic devices contained therein and used to propel the weapon's supply connecting projectiles and wires to its target. While this exacerbates problems of arc penetration for all of the heretofore described weapons, it becomes particularly critical with the already more limited target arcs from stun pistols with clip-on ammunition. The operation of various types of such currently manufactured ammunition are described in U.S. Patent 5,654,867 issued to Murray in 1997, U.S. Patent No. 6,477,933 issued to McNulty and Chudy in 2002 and U.S. Patent No. 5,078,117 issued to Cover in 1992.

[006] Looking at U.S. Patent No. 5,078,117, one finds the supplied current passes from a first contact, through a pyrotechnic device contained in the ammunition cartridge, then, through one first coiled conductor and first tethered projectile, further, through an air gap to a second tethered projectile and second tethered conductor and, finally, to a second contact, which is electrically opposed to the first contact. The pyrotechnic device then detonates and propels the ammunition projectiles and their tethered conductors, which are secured at their other terminations adjacent to

respective contacts of the disabling power supply, to the target. Hopefully, the disabling supply current then arcs from the first contact to and/or through the atmospheric gaps and debris that were the pyrotechnic device to the first conductor, travels through that first conductor and first projectile to the target, then arcs through air gaps in any of the target's garments, passes through the target's body to the second projectile and second conductor and, finally to the second contact. Looking at U.S. Patent No. 6,477,933, one finds that the ammunition cartridge described therein also conducts current through the target by arcing through detonation created air gaps contained in the cartridge. Looking at U.S. Patent No. 5,078,117, one sees that if the inventions described therein were used to conduct their detonating current to a target, the current would also need to arc through detonation-created air gaps in the cartridge on its way through the target.

[007] Of course, if when traveling to the target, the disabling current from the supply could avoid passing through the air gaps left by the pyrotechnic explosions, then, a longer electrical arc for clothing penetration would be available at the target.

SUMMARY OF THE INVENTION

[008] One embodiment of the present invention comprises an apparatus containing two bores. One such bore contains a projectile (A) and a pyrotechnic (A), which is placed behind the projectile (A). The other bore contains a projectile (B) and a pyrotechnic (B), which is placed behind the projectile (B). Projectile (A) is tethered to one end of a conductor. The other end of that conductor is tethered to a contact, which is adjacent to a contact from the first pole of the power supply and a first side of Pyrotechnic (A). Projectile (B) is tethered to one end of a conductor. The other end of that conductor is tethered to a contact, which is adjacent to a contact from the second pole of the power supply and to a first side of Pyrotechnic (B). A conductor and/or air gaps connects the second sides of pyrotechnic charges (A) and (B). No pyrotechnic is present between the contact to which the conductor from Projectile (A) is connected and the contact from the first pole of the power supply. No pyrotechnic is present between the contact to which the conductor from Projectile (B) is connected and the contact from the second pole of the power supply.

[009] An alternative embodiment of the present invention comprises an apparatus containing two bores. One such bore contains a projectile (A) and a pyrotechnic (A), which is placed behind the projectile (A). The other bore contains a projectile (B) and a pyrotechnic (B), which is placed behind the projectile (B). Projectile (A) is tethered to one end of a conductor. The other end of that conductor is tethered to a contact, which is adjacent to a contact from the first pole of the power supply, a first side of pyrotechnic (A) and a connector adjacent to a first side of Pyrotechnic (B). Projectile (B) is tethered to one end of a conductor. The other end of that conductor is tethered to a contact, which is adjacent to a contact from the second pole of the power supply, a second side of pyrotechnic (B) and to a connector adjacent to a second side of Pyrotechnic (A). No pyrotechnic is present between the contact to which the conductor

from Projectile (A) is connected and the contact from the first pole of the power supply. No pyrotechnic is present between the contact to which the conductor from Projectile (B) is connected and the contact from the second pole of the power supply.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The aforementioned objects and advantages of the present invention, as well as additional objects and advantages thereof, will be more fully understood hereinafter as a result of a detailed description of a preferred embodiment when taken in conjunction with the following drawings in which:

[0011] FIG. 1 is a three-dimensional view of an embodiment of the present invention comprising a hand-held stun gun that has been combined with a cartridge containing a pair of wire-tethered darts for disabling a remote target;

[0012] FIG. 2 is an exploded view of the embodiment of FIG. 1;

[0013] FIG. 3 is a partial side view of the embodiment of FIG. 1;

[0014] FIG. 4 is a cross-sectional view of the cartridge of FIG. 1;

[0015] FIG. 5 is a front view of the cartridge of FIG. 1;

[0016] FIG. 6 is a schematic illustration of a prior art electrical layout of a two-dart cartridge;

[0017] FIG. 7 is a schematic illustration of a first embodiment of an improved electrical layout for increasing effectiveness of a two-dart cartridge; and

[0018] FIG. 8 is a schematic illustration of a second embodiment of an improved electrical layout for increasing effectiveness of a two-dart cartridge.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

[0019] Referring to the accompanying drawings and initially FIGs. 1 to 5, it will be seen that a combined stun gun and cartridge 10 comprises a stun gun 12 and a cartridge 14, the latter being releasibly attached to the former to add a remote target immobilization capability to the near target capability of the stun gun. The stun gun 12 comprises an activation switch 16, proximity contacts 18 and 20 and arcing contacts 22 and 24. Arcing contact 22 is preferably larger in diameter than arcing contact 24 so that cartridge 14 cannot be connected to stun gun 12 while facing in the wrong direction which could otherwise cause injury to the user.

[0020] Cartridge 14 comprises a flat rectangular housing 15 having a pair of connectors 26 and 28 designed to mate mechanically with contacts 22 and 24 of stun gun 12 and electrically with contacts 18 and 20 of stun gun 12. Darts 30 and 32 reside in respective cylindrical bores 31 and 33 ready to be propelled toward a remote target by respective pyrotechnics 34 and 36 which sit immediately behind the darts within the bores. Each dart 30, 32 is tethered by a long thin insulated wire 38, 40 which respectively resides in chambers 42, 44 of housing 15. When switch 16 of stun gun 12 is depressed, high voltage is applied to pyrotechnics 34 and 36 through connectors 18 and 20 and ignites the pyrotechnics to release expanding gas to propel wire-tethered darts 30 and 32 toward a remote target out of bores 31 and 33. The voltage is then applied through wires 38 and 40 to the darts which apply the voltage across impact locations on the remote target.

[0021] FIG. 6 illustrates conventional prior art layout of electrical interface between high voltage poles (+) and (-), pyrotechnics and wire tethered darts. Upon application of the high voltage (depression of switch 16), pyrotechnic 36 ignites and a current arcs across remaining gaps to the respective wires 38 and 40 and darts 30 and

32 (which will have already exited their respective bores). This reliance on arcing across gaps left by pyrotechnic 36 causes the aforementioned disadvantages.

[0022] The schematic circuits of FIGs. 7 and 8 illustrate two alternatives to the prior art layout of FIG. 6 which avoid the gap arcing problem. In the layouts of FIGs. 7 and 8, the wiring of the pyrotechnics is designed to ignite them and then cease current flow through them so that there is no reliance on arcing over the gap left by the pyrotechnics in order to deliver current through the darts and the target. The circuit of FIG. 7 effectively connects the pyrotechnics in series with one another, but in parallel with the darts and the target. The circuit of FIG. 8 effectively connects each of the pyrotechnics separately in parallel with the darts and the target. Nevertheless, the pyrotechnics remain physically adjacent their respective darts to effect propulsion of the darts upon their ignition.

[0023] Having thus disclosed a number of illustrative embodiments of the invention herein, it will now be apparent that the illustrated electrical layouts avoid the disadvantages of the prior art. Moreover, it will be understood that variations from the disclosed embodiments may be readily perceived based upon the teaching herein. Accordingly, the scope hereof is to be limited only by the appended claims and their equivalents.

[0024] I claim: